HIGH PERFORMANCE COMPUTING FOR LARGE-SCALE ARMY STRUCTURAL APPLICATIONS

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This presentation describes the use of parallel computing for large-scale analysis of projectile impact and explosive detonation. These tasks are challenging mechanics problems that can require significant computational resources. Various constitutive models[1,2] have been developed and proven to be very successful in modeling such problems, but can be quite computationally intensive and can thus exclude their use for many large-scale applications involving millions of finite elements. Recent efforts at the U.S. Army Engineer Research and Development Center have focused on performing these types of analysis in a production setting with the aide of high performance computing. Therefore, these models have been implemented into a parallel finite element code, ParaAble, developed by the authors[3] for execution on all of the DoD's high performance computing systems. Analyses were performed on as many as 1024 processors of a Cray T3E-1200 as well as on hundreds of processors of an SGI Origin 3900 and Compaq AlphaServer systems. The scalability of typical analyses is given for each of these platforms. Analyses that would require thousands of hours on a single processor of the Cray T3E, for instance, were performed in only a few hours. The parallel performance demonstrates the ability to efficiently perform such analyses by the use of parallel computing.

References

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